Natural Gas Boiler Spreadsheet

Mecklenburg County
Land Use and Environmental Services Agency
Air Quality Division

Helping you breathe easy... for life
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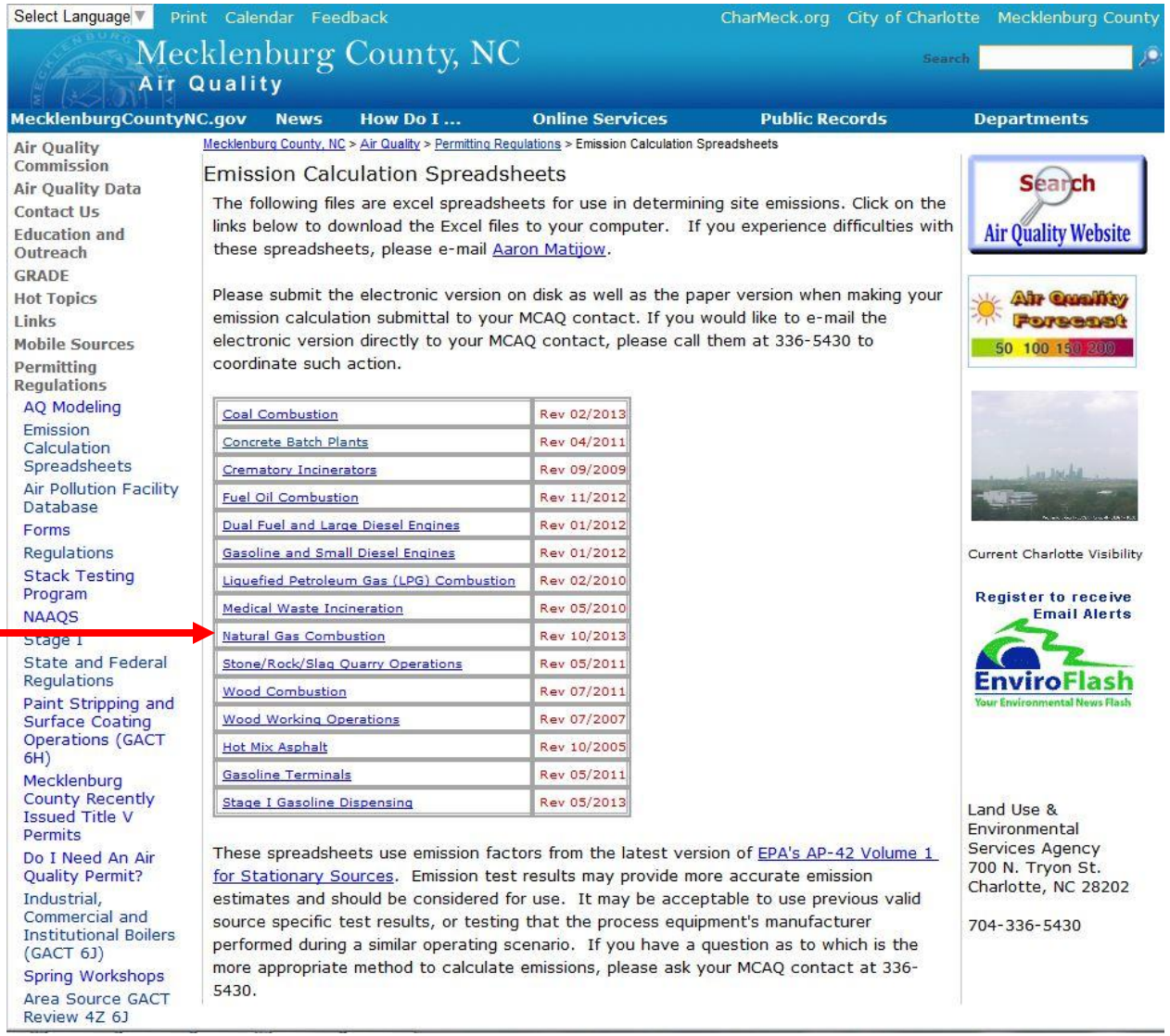
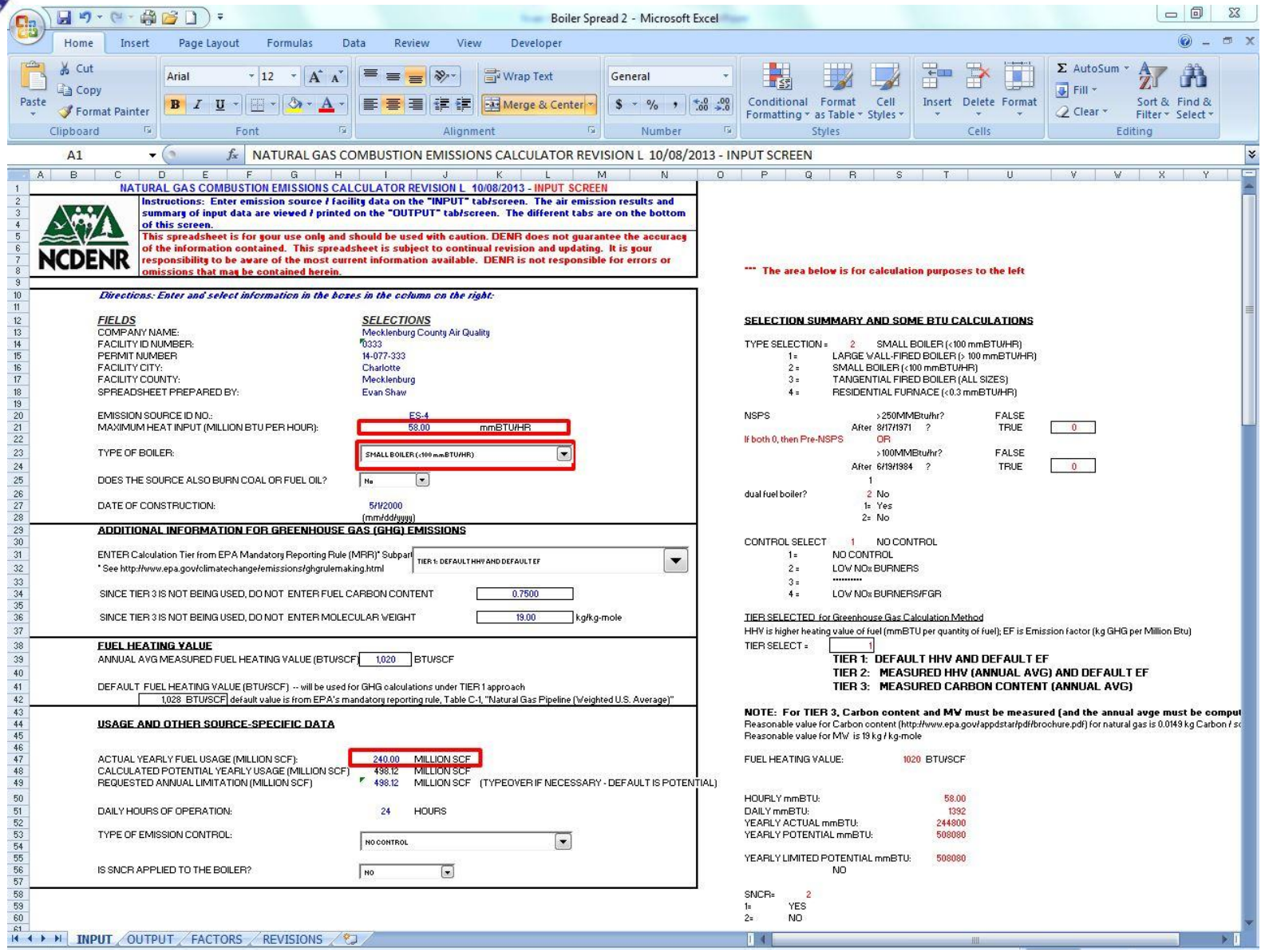
http://airquality.charmeck.org

Finding the Spreadsheet airquality.charmeck.org

Finding the Spreadsheet airquality.charmeck.org



Using the Spreadsheet Input



Using the Spreadsheet Input

NATURAL GAS COMBUSTION EMISSIONS CALCULATOR REVISION L 10/08/2013 - INPUT SCREEN

NCDENR

Instructions: Enter emission source / facility data on the "INPUT" tab/screen. The air emission results and summary of input data are viewed / printed on the "OUTPUT" tab/screen. The different tabs are on the bottom of this screen.

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Directions: Enter and select information in the boxes in the column on the right:

FIELDS	SELECTIONS
COMPANY NAME:	Mecklenburg County Air Quality
FACILITY ID NUMBER:	0333
PERMIT NUMBER	14-077-333
FACILITY CITY:	Charlotte
FACILITY COUNTY:	Mecklenburg
SPREADSHEET PREPARED BY:	Evan Shaw
EMISSION SOURCE ID NO.:	ES-4
MAXIMUM HEAT INPUT (MILLION BTU PER HOUR):	58.00 mmBTU/HR
TYPE OF BOILER:	SMALL BOILER (<100 mmBTU/HR)
DOES THE SOURCE ALSO BURN COAL OR FUEL OIL?	No
DATE OF CONSTRUCTION:	5/1/2000 (mm/dd/yyyy)

ADDITIONAL INFORMATION FOR GREENHOUSE GAS (GHG) EMISSIONS

ENTER Calculation Tier from EPA Mandatory Reporting Rule (MRR)* Subpar: TIER 1: DEFAULT HHV AND DEFAULT EF

* See http://www.epa.gov/climatechange/emissions/ghgrulemaking.html

SINCE TIER 3 IS NOT BEING USED, DO NOT ENTER FUEL CARBON CONTENT: 0.7500

SINCE TIER 3 IS NOT BEING USED, DO NOT ENTER MOLECULAR WEIGHT: 19.00 kg/kg-mole

FUEL HEATING VALUE

ANNUAL AVG MEASURED FUEL HEATING VALUE (BTU/SCF): 1,020 BTU/SCF

DEFAULT FUEL HEATING VALUE (BTU/SCF) -- will be used for GHG calculations under TIER 1 approach

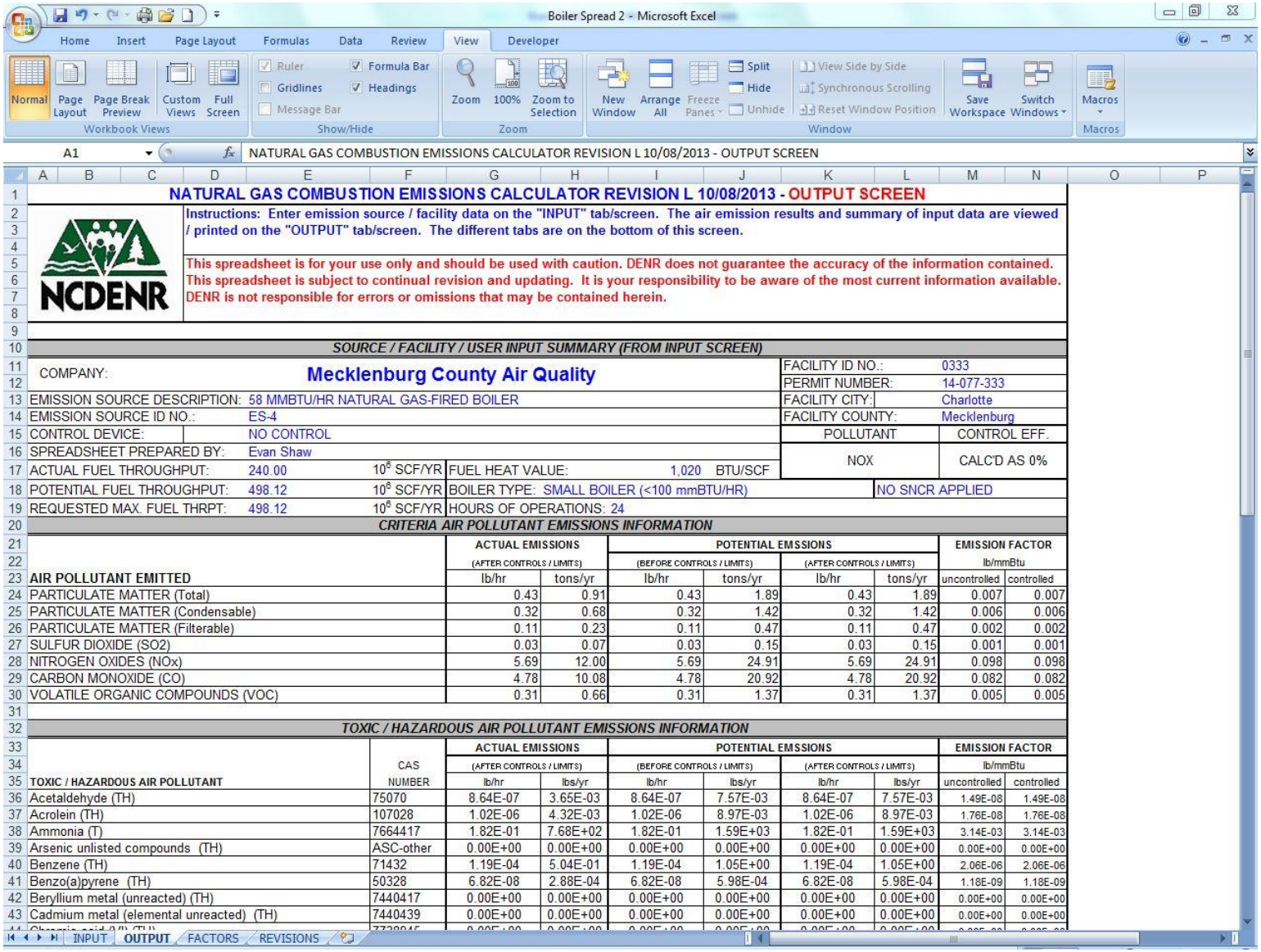
1,028 BTU/SCF default value is from EPA's mandatory reporting rule, Table C-1, "Natural Gas Pipeline (Weighted U.S. Average)"

Using the Spreadsheet Input

USAGE AND OTHER SOURCE-SPECIFIC DATA

ACTUAL YEARLY FUEL USAGE (MILLION SCF):	240.00	MILLION SCF	
CALCULATED POTENTIAL YEARLY USAGE (MILLION SCF)	498.12	MILLION SCF	
REQUESTED ANNUAL LIMITATION (MILLION SCF)	498.12	MILLION SCF	(TYPEOVER IF NECESSARY - DEFAULT IS POTENTIAL)
DAILY HOURS OF OPERATION:	24	HOURS	
TYPE OF EMISSION CONTROL:	NO CONTROL		
IS SNCR APPLIED TO THE BOILER?	NO		

Using the Spreadsheet Output



Boiler Spread 2 - Microsoft Excel

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A1: NATURAL GAS COMBUSTION EMISSIONS CALCULATOR REVISION L 10/08/2013 - OUTPUT SCREEN

NATURAL GAS COMBUSTION EMISSIONS CALCULATOR REVISION L 10/08/2013 - OUTPUT SCREEN

NCDENR

Instructions: Enter emission source / facility data on the "INPUT" tab/screen. The air emission results and summary of input data are viewed / printed on the "OUTPUT" tab/screen. The different tabs are on the bottom of this screen.

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SOURCE / FACILITY / USER INPUT SUMMARY (FROM INPUT SCREEN)

COMPANY:	Mecklenburg County Air Quality			FACILITY ID NO.:	0333
				PERMIT NUMBER:	14-077-333
EMISSION SOURCE DESCRIPTION:	58 MMBTU/HR NATURAL GAS-FIRED BOILER			FACILITY CITY:	Charlotte
EMISSION SOURCE ID NO.:	ES-4			FACILITY COUNTY:	Mecklenburg
CONTROL DEVICE:	NO CONTROL			POLLUTANT	CONTROL EFF.
SPREADSHEET PREPARED BY:	Evan Shaw			NOX	CALC'D AS 0%
ACTUAL FUEL THROUGHPUT:	240.00	10^6 SCF/YR	FUEL HEAT VALUE: 1,020 BTU/SCF		
POTENTIAL FUEL THROUGHPUT:	498.12	10^6 SCF/YR	BOILER TYPE: SMALL BOILER (<100 mmBTU/HR)	NO SNCR APPLIED	
REQUESTED MAX. FUEL THRPT:	498.12	10^6 SCF/YR	HOURS OF OPERATIONS: 24		

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION

	ACTUAL EMISSIONS (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)		EMISSION FACTOR lb/mmBtu	
AIR POLLUTANT EMITTED	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	uncontrolled	controlled
PARTICULATE MATTER (Total)	0.43	0.91	0.43	1.89	0.43	1.89	0.007	0.007
PARTICULATE MATTER (Condensable)	0.32	0.68	0.32	1.42	0.32	1.42	0.006	0.006
PARTICULATE MATTER (Filterable)	0.11	0.23	0.11	0.47	0.11	0.47	0.002	0.002
SULFUR DIOXIDE (SO2)	0.03	0.07	0.03	0.15	0.03	0.15	0.001	0.001
NITROGEN OXIDES (NOx)	5.69	12.00	5.69	24.91	5.69	24.91	0.098	0.098
CARBON MONOXIDE (CO)	4.78	10.08	4.78	20.92	4.78	20.92	0.082	0.082
VOLATILE ORGANIC COMPOUNDS (VOC)	0.31	0.66	0.31	1.37	0.31	1.37	0.005	0.005

TOXIC / HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION

		ACTUAL EMISSIONS (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)		EMISSION FACTOR lb/mmBtu	
TOXIC / HAZARDOUS AIR POLLUTANT	CAS NUMBER	lb/hr	lbs/yr	lb/hr	lbs/yr	lb/hr	lbs/yr	uncontrolled	controlled
Acetaldehyde (TH)	75070	8.64E-07	3.65E-03	8.64E-07	7.57E-03	8.64E-07	7.57E-03	1.49E-08	1.49E-08
Acrolein (TH)	107028	1.02E-06	4.32E-03	1.02E-06	8.97E-03	1.02E-06	8.97E-03	1.76E-08	1.76E-08
Ammonia (T)	7664417	1.82E-01	7.68E+02	1.82E-01	1.59E+03	1.82E-01	1.59E+03	3.14E-03	3.14E-03
Arsenic unlisted compounds (TH)	ASC-other	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene (TH)	71432	1.19E-04	5.04E-01	1.19E-04	1.05E+00	1.19E-04	1.05E+00	2.06E-06	2.06E-06
Benzo(a)pyrene (TH)	50328	6.82E-08	2.88E-04	6.82E-08	5.98E-04	6.82E-08	5.98E-04	1.18E-09	1.18E-09
Beryllium metal (unreacted) (TH)	7440417	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium metal (elemental unreacted) (TH)	7440439	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

INPUT | OUTPUT | FACTORS | REVISIONS

Using the Spreadsheet Output

NATURAL GAS COMBUSTION EMISSIONS CALCULATOR REVISION L 10/08/2013 - OUTPUT SCREEN

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EMISSION SOURCE ID NO.:	ES-4				FACILITY CITY:	Charlotte	
CONTROL DEVICE:	NO CONTROL				FACILITY COUNTY:	Mecklenburg	
SPREADSHEET PREPARED BY:	Evan Shaw				POLLUTANT	CONTROL EFF.	
ACTUAL FUEL THROUGHPUT:	240.00	10^6 SCF/YR	FUEL HEAT VALUE:	1,020 BTU/SCF	NOX	CALC'D AS 0%	
POTENTIAL FUEL THROUGHPUT:	498.12	10^6 SCF/YR	BOILER TYPE: SMALL BOILER (<100 mmBTU/HR)		NO SNCR APPLIED		
REQUESTED MAX. FUEL THRPT:	498.12	10^6 SCF/YR	HOURS OF OPERATIONS: 24				

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	ACTUAL EMISSIONS (AFTER CONTROLS / LIMITS)		POTENTIAL EMSSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMSSIONS (AFTER CONTROLS / LIMITS)		EMISSION FACTOR lb/mmBtu	
AIR POLLUTANT EMITTED	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	uncontrolled	controlled
PARTICULATE MATTER (Total)	0.43	0.91	0.43	1.89	0.43	1.89	0.007	0.007
PARTICULATE MATTER (Condensable)	0.32	0.68	0.32	1.42	0.32	1.42	0.006	0.006
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Using the Spreadsheet Output

TOXIC / HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION									
		ACTUAL EMISSIONS		POTENTIAL EMSSIONS				EMISSION FACTOR	
	CAS	(AFTER CONTROLS / LIMITS)		(BEFORE CONTROLS / LIMITS)		(AFTER CONTROLS / LIMITS)		lb/mmBtu	
TOXIC / HAZARDOUS AIR POLLUTANT	NUMBER	lb/hr	lbs/yr	lb/hr	lbs/yr	lb/hr	lbs/yr	uncontrolled	controlled
Acetaldehyde (TH)	75070	8.64E-07	3.65E-03	8.64E-07	7.57E-03	8.64E-07	7.57E-03	1.49E-08	1.49E-08
Acrolein (TH)	107028	1.02E-06	4.32E-03	1.02E-06	8.97E-03	1.02E-06	8.97E-03	1.76E-08	1.76E-08
Ammonia (T)	7664417	1.82E-01	7.68E+02	1.82E-01	1.59E+03	1.82E-01	1.59E+03	3.14E-03	3.14E-03
Arsenic unlisted compounds (TH)	ASC-other	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene (TH)	71432	1.19E-04	5.04E-01	1.19E-04	1.05E+00	1.19E-04	1.05E+00	2.06E-06	2.06E-06
Benzo(a)pyrene (TH)	50328	6.82E-08	2.88E-04	6.82E-08	5.98E-04	6.82E-08	5.98E-04	1.18E-09	1.18E-09
Beryllium metal (unreacted) (TH)	7440417	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium metal (elemental unreacted) (TH)	7440439	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromic acid (VI) (TH)	7738945	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt unlisted compounds (H)	COC-other	4.78E-06	2.02E-02	4.78E-06	4.18E-02	4.78E-06	4.18E-02	8.24E-08	8.24E-08
Formaldehyde (TH)	50000	4.26E-03	1.80E+01	4.26E-03	3.74E+01	4.26E-03	3.74E+01	7.35E-05	7.35E-05
Hexane, n- (TH)	110543	1.02E-01	4.32E+02	1.02E-01	8.97E+02	1.02E-01	8.97E+02	1.76E-03	1.76E-03
Lead unlisted compounds (H)	PBC-other	2.84E-05	1.20E-01	2.84E-05	2.49E-01	2.84E-05	2.49E-01	4.90E-07	4.90E-07
Manganese unlisted compounds (TH)	MNC-other	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury vapor (TH)	7439976	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Napthalene (H)	91203	3.47E-05	1.46E-01	3.47E-05	3.04E-01	3.47E-05	3.04E-01	5.98E-07	5.98E-07
Nickel metal (TH)	7440020	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Selenium compounds (H)	SEC	1.36E-06	5.76E-03	1.36E-06	1.20E-02	1.36E-06	1.20E-02	2.35E-08	2.35E-08
Toluene (TH)	108883	1.93E-04	8.16E-01	1.93E-04	1.69E+00	1.93E-04	1.69E+00	3.33E-06	3.33E-06
Total HAPs		1.07E-01	4.52E+02	1.07E-01	9.37E+02	1.07E-01	9.37E+02	1.84E-03	1.84E-03
Highest HAP	Hexane	1.02E-01	4.32E+02	1.02E-01	8.97E+02	1.02E-01	8.97E+02	1.76E-03	1.76E-03

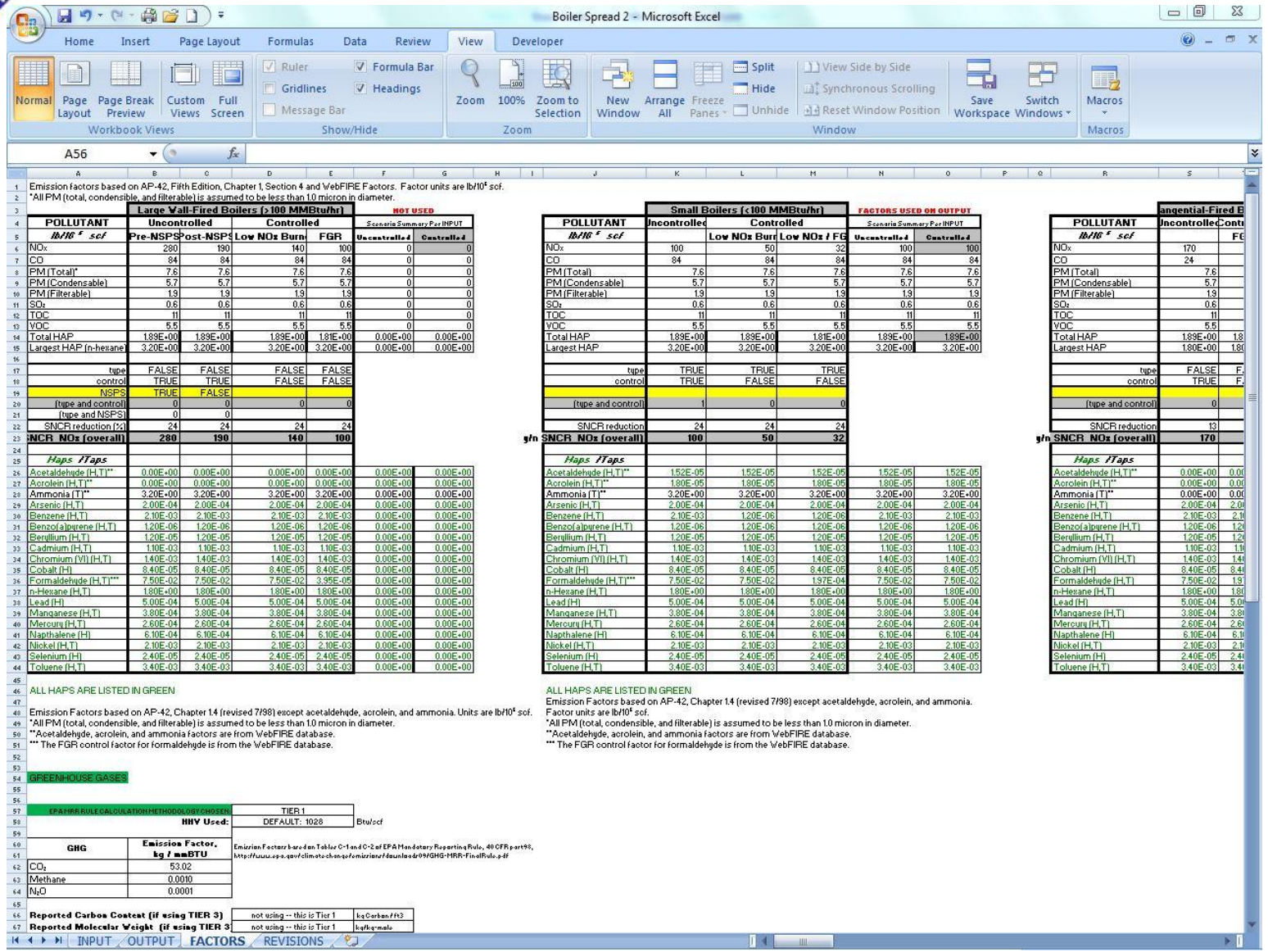
TOXIC AIR POLLUTANT EMISSIONS INFORMATION (FOR PERMITTING PURPOSES)						
	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS				EMISSION FACTOR lb/mmBtu	
TOXIC AIR POLLUTANT	CAS Num.	lb/hr	lb/day	lb/yr	uncontrolled	controlled
Acetaldehyde (TH)	75070	8.64E-07	2.07E-05	3.65E-03	1.49E-08	1.49E-08
Acrolein (TH)	107028	1.02E-06	2.46E-05	4.32E-03	1.76E-08	1.76E-08
Ammonia (T)	7664417	1.82E-01	4.37E+00	7.68E+02	3.14E-03	3.14E-03
Arsenic unlisted compounds (TH)	ASC-other	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene (TH)	71432	1.19E-04	2.87E-03	5.04E-01	2.06E-06	2.06E-06
Benzo(a)pyrene (TH)	50328	6.82E-08	1.64E-06	2.88E-04	1.18E-09	1.18E-09
Beryllium metal (unreacted) (TH)	7440417	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium metal (elemental unreacted) (TH)	7440439	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Soluble chromate compounds, as chromium (VI) equivaler	SolCR6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde (TH)	50000	4.26E-03	1.02E-01	1.80E+01	7.35E-05	7.35E-05
Hexane, n- (TH)	110543	1.02E-01	2.46E+00	4.32E+02	1.76E-03	1.76E-03
Manganese unlisted compounds (TH)	MNC-other	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury vapor (TH)	7439976	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel metal (TH)	7440020	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene (TH)	108883	1.93E-04	4.64E-03	8.16E-01	3.33E-06	3.33E-06

Using the Spreadsheet Output

GREENHOUSE GAS EMISSIONS INFORMATION (FOR EMISSIONS INVENTORY PURPOSES) - CONSISTENT WITH EPA MANDATORY REPORTING RULE (MRR) METHOD				*GHG - POTENTIAL TO EMIT NOT BASED ON EPA MRR METHOD*	
GREENHOUSE GAS POLLUTANT	**ACTUAL EMISSIONS** EPA MRR CALCULATION METHOD: TIER 1			**POTENTIAL EMISSIONS**	
	metric tons/yr	metric tons/yr, **CO2e**	short tons/yr	short tons/yr	short tons/yr, **CO2e**
CARBON DIOXIDE (CO_2)	13081.09	13,081.09	14,419.42	29,694.47	29694.47
METHANE (CH_4)	2.47E-01	5.18E+00	2.72E-01	5.60E-01	1.18E+01
NITROUS OXIDE (N_2O)	2.47E-02	7.65E+00	2.72E-02	5.60E-02	1.74E+01
		TOTAL CO2e (metric tons) **13,093.92**			TOTAL CO2e (short tons) **29,723.59**

NOTE: CO2e means CO2 equivalent
NOTE: The DAQ Air Emissions Reporting Online (AERO) system requires short tons be reported. The EPA MRR requires metric tons be reported.
NOTE: Do not use greenhouse gas emission estimates from this spreadsheet for PSD (Prevention of Significant Deterioration) purposes.

AP-42 Emission Factors



Boiler Spread 2 - Microsoft Excel

Emission factors based on AP-42, Fifth Edition, Chapter 1, Section 4 and WebFIRE Factors. Factor units are lb/10⁶ scf.
*All PM (total, condensible, and filterable) is assumed to be less than 1.0 micron in diameter.

Large Wall-Fired Boilers (>100 MMBtu/hr)					NOT USED	
POLLUTANT	Uncontrolled		Controlled		Scenario Summary For INPUT	
lb/10⁶ scf	Pre-NSPS	Post-NSPS	Low NOx Burn	FGR	Uncontrolled	Controlled
NOx	280	190	140	100	0	0
CO	84	84	84	84	0	0
PM (Total)*	7.6	7.6	7.6	7.6	0	0
PM (Condensable)	5.7	5.7	5.7	5.7	0	0
PM (Filterable)	1.9	1.9	1.9	1.9	0	0
SO₂	0.6	0.6	0.6	0.6	0	0
TOC	11	11	11	11	0	0
VOC	5.5	5.5	5.5	5.5	0	0
Total HAP	1.89E+00	1.89E+00	1.89E+00	1.81E+00	0.00E+00	0.00E+00
Largest HAP (n-hexane)	3.20E+00	3.20E+00	3.20E+00	3.20E+00	0.00E+00	0.00E+00
type	FALSE	FALSE	FALSE	FALSE		
control	TRUE	TRUE	FALSE	FALSE		
NSPS	TRUE	FALSE				
(type and control)	0	0	0	0		
(type and NSPS)	0	0				
SNCR reduction (%)	24	24	24	24		
SNCR_NOx (overall)	280	190	140	100		
Haps fTaps						
Acetaldehyde (H,T)**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acrolein (H,T)**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ammonia (T)**	3.20E+00	3.20E+00	3.20E+00	3.20E+00	0.00E+00	0.00E+00
Arsenic (H,T)	2.00E-04	2.00E-04	2.00E-04	2.00E-04	0.00E+00	0.00E+00
Benzene (H,T)	2.10E-03	2.10E-03	2.10E-03	2.10E-03	0.00E+00	0.00E+00
Benzo(a)pyrene (H,T)	1.20E-06	1.20E-06	1.20E-06	1.20E-06	0.00E+00	0.00E+00
Beryllium (H,T)	1.20E-05	1.20E-05	1.20E-05	1.20E-05	0.00E+00	0.00E+00
Cadmium (H,T)	1.10E-03	1.10E-03	1.10E-03	1.10E-03	0.00E+00	0.00E+00
Chromium (VI) (H,T)	1.40E-03	1.40E-03	1.40E-03	1.40E-03	0.00E+00	0.00E+00
Cobalt (H)	8.40E-05	8.40E-05	8.40E-05	8.40E-05	0.00E+00	0.00E+00
Formaldehyde (H,T)***	7.50E-02	7.50E-02	7.50E-02	3.95E-05	0.00E+00	0.00E+00
n-Hexane (H,T)	1.80E+00	1.80E+00	1.80E+00	1.80E+00	0.00E+00	0.00E+00
Lead (H)	5.00E-04	5.00E-04	5.00E-04	5.00E-04	0.00E+00	0.00E+00
Manganese (H,T)	3.80E-04	3.80E-04	3.80E-04	3.80E-04	0.00E+00	0.00E+00
Mercury (H,T)	2.60E-04	2.60E-04	2.60E-04	2.60E-04	0.00E+00	0.00E+00
Napthalene (H)	6.10E-04	6.10E-04	6.10E-04	6.10E-04	0.00E+00	0.00E+00
Nickel (H,T)	2.10E-03	2.10E-03	2.10E-03	2.10E-03	0.00E+00	0.00E+00
Selenium (H)	2.40E-05	2.40E-05	2.40E-05	2.40E-05	0.00E+00	0.00E+00
Toluene (H,T)	3.40E-03	3.40E-03	3.40E-03	3.40E-03	0.00E+00	0.00E+00

ALL HAPS ARE LISTED IN GREEN

Emission Factors based on AP-42, Chapter 1.4 (revised 7/98) except acetaldehyde, acrolein, and ammonia. Units are lb/10⁶ scf.
*All PM (total, condensible, and filterable) is assumed to be less than 1.0 micron in diameter.
**Acetaldehyde, acrolein, and ammonia factors are from WebFIRE database.
*** The FGR control factor for formaldehyde is from the WebFIRE database.

GREENHOUSE GASES

EPA MRR RULE CALCULATION METHODOLOGY CHOSEN:	TIER 1	
HHV Used:	DEFAULT: 1028	Btu/scf

GHG	Emission Factor, kg / mmBTU
CO_2	53.02
Methane	0.0010
N_2O	0.0001

Emission Factors based on Tables C-1 and C-2 of EPA Mandatory Reporting Rule, 40 CFR part 98, http://www.epa.gov/climatechange/emissions/downloads09/GHG-MRR-FinalRule.pdf

Reported Carbon Content (if using TIER 3)	not using -- this is Tier 1	kg Carbon / ft3
Reported Molecular Weight (if using TIER 3	not using -- this is Tier 1	kg/kg-mole

Small Boilers (<100 MMBtu/hr)				FACTORS USED ON OUTPUT	
POLLUTANT	Uncontrolled	Controlled		Scenario Summary For INPUT	
lb/10⁶ scf		Low NOx Burn	Low NOx / FG	Uncontrolled	Controlled
NOx	100	50	32	100	100
CO	84	84	84	84	84
PM (Total)	7.6	7.6	7.6	7.6	7.6
PM (Condensable)	5.7	5.7	5.7	5.7	5.7
PM (Filterable)	1.9	1.9	1.9	1.9	1.9
SO₂	0.6	0.6	0.6	0.6	0.6
TOC	11	11	11	11	11
VOC	5.5	5.5	5.5	5.5	5.5
Total HAP	1.89E+00	1.89E+00	1.81E+00	1.89E+00	1.89E+00
Largest HAP	3.20E+00	3.20E+00	3.20E+00	3.20E+00	3.20E+00
type	TRUE	TRUE	TRUE		
control	TRUE	FALSE	FALSE		
(type and control)	1	0	0		
SNCR reduction	24	24	24		
g/h SNCR_NOx (overall)	100	50	32		
Haps fTaps					
Acetaldehyde (H,T)**	1.52E-05	1.52E-05	1.52E-05	1.52E-05	1.52E-05
Acrolein (H,T)**	1.80E-05	1.80E-05	1.80E-05	1.80E-05	1.80E-05
Ammonia (T)**	3.20E+00	3.20E+00	3.20E+00	3.20E+00	3.20E+00
Arsenic (H,T)	2.00E-04	2.00E-04	2.00E-04	2.00E-04	2.00E-04
Benzene (H,T)	2.10E-03	1.20E-06	1.20E-06	2.10E-03	2.10E-03
Benzo(a)pyrene (H,T)	1.20E-06	1.20E-06	1.20E-06	1.20E-06	1.20E-06
Beryllium (H,T)	1.20E-05	1.20E-05	1.20E-05	1.20E-05	1.20E-05
Cadmium (H,T)	1.10E-03	1.10E-03	1.10E-03	1.10E-03	1.10E-03
Chromium (VI) (H,T)	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03
Cobalt (H)	8.40E-05	8.40E-05	8.40E-05	8.40E-05	8.40E-05
Formaldehyde (H,T)***	7.50E-02	7.50E-02	1.97E-04	7.50E-02	7.50E-02
n-Hexane (H,T)	1.80E+00	1.80E+00	1.80E+00	1.80E+00	1.80E+00
Lead (H)	5.00E-04	5.00E-04	5.00E-04	5.00E-04	5.00E-04
Manganese (H,T)	3.80E-04	3.80E-04	3.80E-04	3.80E-04	3.80E-04
Mercury (H,T)	2.60E-04	2.60E-04	2.60E-04	2.60E-04	2.60E-04
Napthalene (H)	6.10E-04	6.10E-04	6.10E-04	6.10E-04	6.10E-04
Nickel (H,T)	2.10E-03	2.10E-03	2.10E-03	2.10E-03	2.10E-03
Selenium (H)	2.40E-05	2.40E-05	2.40E-05	2.40E-05	2.40E-05
Toluene (H,T)	3.40E-03	3.40E-03	3.40E-03	3.40E-03	3.40E-03

ALL HAPS ARE LISTED IN GREEN
Emission Factors based on AP-42, Chapter 1.4 (revised 7/98) except acetaldehyde, acrolein, and ammonia.
Factor units are lb/10⁶ scf.
*All PM (total, condensible, and filterable) is assumed to be less than 1.0 micron in diameter.
**Acetaldehyde, acrolein, and ammonia factors are from WebFIRE database.
*** The FGR control factor for formaldehyde is from the WebFIRE database.

angential-Fired B		
POLLUTANT	Uncontrolle	Contr
lb/10⁶ scf		FG
NOx	170	
CO	24	
PM (Total)	7.6	
PM (Condensable)	5.7	
PM (Filterable)	1.9	
SO₂	0.6	
TOC	11	
VOC	5.5	
Total HAP	1.89E+00	1.8
Largest HAP	1.80E+00	1.8
type	FALSE	F
control	TRUE	F
(type and control)	0	
SNCR reduction	13	
g/h SNCR_NOx (overall)	170	
Haps fTaps		
Acetaldehyde (H,T)**	0.00E+00	0.0
Acrolein (H,T)**	0.00E+00	0.0
Ammonia (T)**	0.00E+00	0.0
Arsenic (H,T)	2.00E-04	2.0
Benzene (H,T)	2.10E-03	2.1
Benzo(a)pyrene (H,T)	1.20E-06	1.2
Beryllium (H,T)	1.20E-05	1.2
Cadmium (H,T)	1.10E-03	1.1
Chromium (VI) (H,T)	1.40E-03	1.4
Cobalt (H)	8.40E-05	8.4
Formaldehyde (H,T)	7.50E-02	1.9
n-Hexane (H,T)	1.80E+00	1.8
Lead (H)	5.00E-04	5.0
Manganese (H,T)	3.80E-04	3.8
Mercury (H,T)	2.60E-04	2.6
Napthalene (H)	6.10E-04	6.1
Nickel (H,T)	2.10E-03	2.1
Selenium (H)	2.40E-05	2.4
Toluene (H,T)	3.40E-03	3.4

INPUT | OUTPUT | FACTORS | REVISIONS

AP-42 Emission Factors

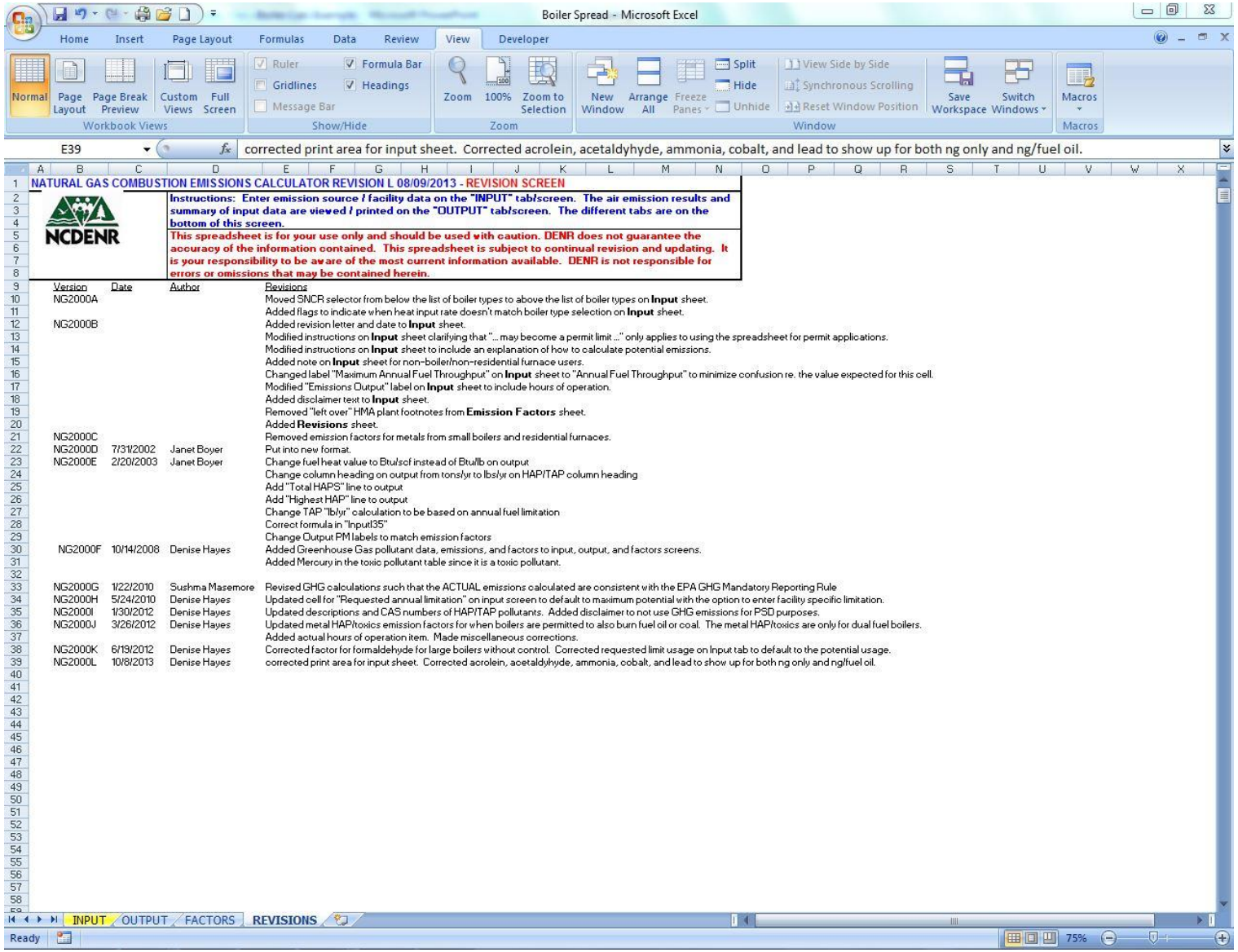
Emission Factor:

"A representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. These factors are usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant (e.g., kilograms of particulate emitted per megagram of coal burned). Such factors facilitate estimation of emissions from various sources of air pollution. In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all facilities in the source category (i.e., a population average)."

-EPA AP-42 website (http://www.epa.gov/ttnchie1/ap42/)

AP-42 has been published since 1972 as the primary compilation of EPA's emission factor information.

Revisions


Boiler Spread - Microsoft Excel
Home
Insert
Page Layout
Formulas
Data
Review
View
Developer
Normal
Page Layout
Page Break Preview
Custom Views
Full Screen
Workbook Views
Ruler
Gridlines
Message Bar
Formula Bar
Headings
Show/Hide
Zoom
100%
Zoom to Selection
Zoom
New Window
Arrange All
Freeze Panes
Split
Hide
Unhide
View Side by Side
Synchronous Scrolling
Reset Window Position
Save Workspace
Switch Windows
Window
Macros
Macros
E39
corrected print area for input sheet. Corrected acrolein, acetaldyhyde, ammonia, cobalt, and lead to show up for both ng only and ng/fuel oil.
NATURAL GAS COMBUSTION EMISSIONS CALCULATOR REVISION L 08/09/2013 - REVISION SCREEN
NCDENR
Instructions: Enter emission source / facility data on the "INPUT" tab/screen. The air emission results and summary of input data are viewed / printed on the "OUTPUT" tab/screen. The different tabs are on the bottom of this screen.
This spreadsheet is for your use only and should be used with caution. DENR does not guarantee the accuracy of the information contained. This spreadsheet is subject to continual revision and updating. It is your responsibility to be aware of the most current information available. DENR is not responsible for errors or omissions that may be contained herein.
Version | Date | Author | Revisions
NG2000A | | | Moved SNCR selector from below the list of boiler types to above the list of boiler types on Input sheet.
| | | | Added flags to indicate when heat input rate doesn't match boiler type selection on Input sheet.
NG2000B | | | Added revision letter and date to Input sheet.
| | | | Modified instructions on Input sheet clarifying that "... may become a permit limit ..." only applies to using the spreadsheet for permit applications.
| | | | Modified instructions on Input sheet to include an explanation of how to calculate potential emissions.
| | | | Added note on Input sheet for non-boiler/non-residential furnace users.
| | | | Changed label "Maximum Annual Fuel Throughput" on Input sheet to "Annual Fuel Throughput" to minimize confusion re. the value expected for this cell.
| | | | Modified "Emissions Output" label on Input sheet to include hours of operation.
| | | | Added disclaimer text to Input sheet.
| | | | Removed "left over" HMA plant footnotes from Emission Factors sheet.
| | | | Added Revisions sheet.
NG2000C | | | Removed emission factors for metals from small boilers and residential furnaces.
NG2000D | 7/31/2002 | Janet Boyer | Put into new format.
NG2000E | 2/20/2003 | Janet Boyer | Change fuel heat value to Btu/scf instead of Btu/lb on output
| | | | Change column heading on output from tons/yr to lbs/yr on HAP/TAP column heading
| | | | Add "Total HAPS" line to output
| | | | Add "Highest HAP" line to output
| | | | Change TAP "lb/yr" calculation to be based on annual fuel limitation
| | | | Correct formula in "Input!35"
| | | | Change Output PM labels to match emission factors
NG2000F | 10/14/2008 | Denise Hayes | Added Greenhouse Gas pollutant data, emissions, and factors to input, output, and factors screens.
| | | | Added Mercury in the toxic pollutant table since it is a toxic pollutant.
NG2000G | 1/22/2010 | Sushma Masemore | Revised GHG calculations such that the ACTUAL emissions calculated are consistent with the EPA GHG Mandatory Reporting Rule
NG2000H | 5/24/2010 | Denise Hayes | Updated cell for "Requested annual limitation" on input screen to default to maximum potential with the option to enter facility specific limitation.
NG2000I | 1/30/2012 | Denise Hayes | Updated descriptions and CAS numbers of HAP/TAP pollutants. Added disclaimer to not use GHG emissions for PSD purposes.
NG2000J | 3/26/2012 | Denise Hayes | Updated metal HAP/toxics emission factors for when boilers are permitted to also burn fuel oil or coal. The metal HAP/toxics are only for dual fuel boilers.
| | | | Added actual hours of operation item. Made miscellaneous corrections.
NG2000K | 6/19/2012 | Denise Hayes | Corrected factor for formaldehyde for large boilers without control. Corrected requested limit usage on Input tab to default to the potential usage.
NG2000L | 10/8/2013 | Denise Hayes | corrected print area for input sheet. Corrected acrolein, acetaldyhyde, ammonia, cobalt, and lead to show up for both ng only and ng/fuel oil.
INPUT
OUTPUT
FACTORS
REVISIONS
Ready
75%

Example

naturalgascombustion.xls